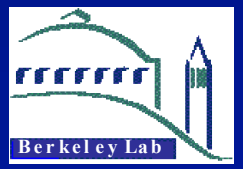
Demand Response Programs: An Emerging Resource for Electricity Markets - Opportunities for Federal Customers



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FUPWG Meeting
Oklahoma City, OK

October 11, 2001

Overview

- Why the Renewed Interest in Demand Response (DR) Programs?
- Types of DR Programs
- DR Programs offered in Region (OK, KS, MO, AR)
- DR Programs: Operational experience during Summer 2001
- Case Studies of Innovative Programs
- Opportunities for Federal Customers

Why the Renewed Interest in Demand Response Programs?

- Network congestion and generation shortfalls
- Price volatility in bulk power markets
- Electric emergencies in California & New York
- FERC rulings encouraging more use of price-responsive demand management
- Improved capabilities & economics of control & communications technology
- Explosion of new & innovative program designs

Types of Demand Response Programs

- Commercial/Industrial Non-Firm Rates (Interruptible)
  - Up-front (reservation) payments in the form of rate discounts for curtailments to pre-set Firm Service Level
  - Significant penalties for non-compliance
- Direct Load Control
  - Utility control of customer end use loads (partial or complete interruption of air conditioners, water heaters, pool pumps)
- Demand Bidding: “Call Options”
  - Reservation payments and energy reduction payments.
  - Customer selects Strike Price. LSE can “Call” the customer, requiring them to reduce load or face penalties, whenever projected Mkt. Price > Strike Price
- Demand Bidding: “Quote Options”
  - Purely voluntary. Utilities post prices on a day-ahead basis and customers pledge reductions based on when and at what price they are willing to reduce demand that day only
- Dynamic Pricing (e.g., real-time pricing)

DR Programs offered in Region

State	Utility	Program Name	Program Type	Incentive
Oklahoma	OG&E Company	Load Curtailment Rider	Interruptible	~$2.00/kW-month reservation payment
Oklahoma	OG&E Company	Interruptible Rider	Interruptible	~$2.50/kW-month reservation payment
Kansas, Missouri	KCPL	Peak Load Curtailment Credit	Interruptible	$10/kW-month reservation payment
Kansas, Missouri	KCPL	Voluntary Load Reduction Rider	Quote	performance payment varies w/ offer
Kansas	West Plains Energy	Voluntary Load Reduction Rider	Quote	performance payment varies w/ offer
Arkansas	Entergy	Market Valued Call Option Service	Call	reservation payment + $100-$250/MWh performance payment
Arkansas	Entergy	Market Valued Energy Service	Quote	performance payment based on accepted bid
Arkansas	Entergy	Energy Reduction Rider	Quote	performance payment varies w/ offer
Arkansas	Southwestern Electric Power Company	Curtailable Service Rider	Interruptible	~$3.00/kW-month reservation payment

DR Programs: Operational Experience during 2001

NY ISO Emergency Demand Response Program

- 300 end-users registered, 700 MW potential load reduction
- Four events called during Summer 2001
- 450 MW average demand relief provided

NY ISO Day-Ahead Demand Response Program

- 24 Participants registered, 300 MW load reduction capability
- Bids accepted almost daily, from July through September
- 28 MW of maximum demand relief provided

NE ISO Demand Response and Price Response Programs

- 101 individual sites registered, 63 MW potential load reduction
- Price Response program activated for 16 hours on July 24 and 25, prices spiked to cap of $1000/MWh
- 25 MW average demand relief provided

Case Study: California's Demand Response Programs

- California's previous demand response programs helped the ISO to manage the Summer 2000 and Winter 2001 shortfalls
- As crisis deepened in Summer 2001, CPUC revamped and expanded Load Curtailment Programs offered by PG&E, SCE & SDGE
- Role of DWR as the financial backer of all net short energy transactions still being defined
- Large rate increases effective June 1 for most customers provide another entirely separate incentive to reduce usage in all hours

CA Case Study: Non-Firm "Interruptible" Rate Program (2000)

- 15% Rate discounts for ~1500 large customers ($220M/year) to curtail up to 100-150 hrs/year on 25-30 occasions
- Average delivered load curtailment at peak during 2000: PG&E (490 MW), SCE (1200 MW), and SDG&E (40 MW)
- On Aug. 2, 2000 statewide non-firm demand reductions peaked at 2190 MW – almost 5% of statewide peak demand
- Generally dependable "Reliability" resource, except:
  - Very expensive when rarely utilized
  - In 2000 some ~600 MW at SCE failed to interrupt when requested and incurred substantial penalties ($92M)
  - 25%, or 124 MW, of PG&E's load dropped out in 2000 after 15+ curtailments
- Conclusion: In 2000, "rolling blackouts" were averted on at least 5 occasions because of the non firm & other demand programs

Case Study – Bonneville Power Administration's Peak Load Mgmt. Demand Exchange Program

- **Hedge against hydro energy shortages & high wholesale prices**
- **Uses a web-based auction site containing day ahead & 2-day-ahead pricing**
- Day-ahead "Load curtailment" requests at 9 AM give customers until noon to pledge hourly demand reductions at the pre-set price.
- **Large customers & aggregators post ability to voluntarily curtail loads at a given price.**
- Pulp and paper and aluminum/basic metals are the two most represented SIC codes.
- **Summer 2001 goal is 25 MW**
- BPA estimates the ***maximum economic potential*** for this program at 1200-1500 MW

Case Study: Cinergy's PowerShare Pricing Programs

- PowerShare provides financial incentives to encourage customers to reduce peak load
- Both of these programs serve the need for a financial hedge against wholesale price volatility and a physical hedge against supply uncertainty.
- PowerShare includes a menu of both Call and Quote options differentiated by Strike Price, curtailment length, and curtailment frequency
- Customers must have interval meters and a potential load response of at least 500 kW
- Customers select Strike Prices of 10, 30, 60, or 90 cents per kWh based on their costs of complying with curtailments
- Cinergy notifies customers when day-ahead market prices are greater than their Strike Price

Case Study: Cinergy's PowerShare Pricing Programs (2)

- Call customers receive a guaranteed premium plus an additional Energy Credit whenever called. Quote customers receive an Energy Credit only.
- As of early 2001, 90% of Cinergy's 312 largest (over 500 kW) customers participated
- Of this 2500 MW load block, Cinergy estimates 600 MW of demand reduction
- Per-customer load reduction averages 10-15%, up to 50% for some large industrials
- In 2001 Cinergy will use an individualized CD ROM individualized to help the recruitment of new customers in the 200-500 kW size range.

Case Study – PJM's Load Response Pilot Program

- The 2001 Retail Pilot includes an **emergency option** and a brand-new **economic option.**
- Emergency Option
  - Eligible participants: supply required load via non-synchronized generation or through measurable and verifiable load curtailments
  - Minimum demand reduction: 100 kW within one hour; need interval metering
- Economic option
  - Incentives to reduce demand on the PJM system and share the savings of wholesale prices higher than retail rates
  - Billing and settlement is made directly between PJM ISO and market participants; payments based on actual spot prices

Enabling Technologies for Demand Response Programs

- Interval metering, energy monitoring and load data display capabilities
- Offerer-participant interface capabilities (for notification, alarming & remote control)
- Software to enable analysis and enhanced performance by facility operators
- Building automation & energy management systems
- Interface/controls for back-up generation
- Aggregation of multiple sites
- Billing & settlement, including verification of performance

Potential Curtailment Actions at Federal Customer Facilities

HVAC

- Turn off chillers or use economizer
- Increase zone temperatures
- Reduce flow through supply and return fans
- Increase supply air temperature
- Increase chilled water temperature
- Reduce chilled water flow

Other

- Turn off all unnecessary lighting
- Turn off all non-essential office equipment
- Run back up or emergency generators